Sustainability Speaker Series 2018

Sunnyvale

Climate Action Playbook

Coming this Fall!

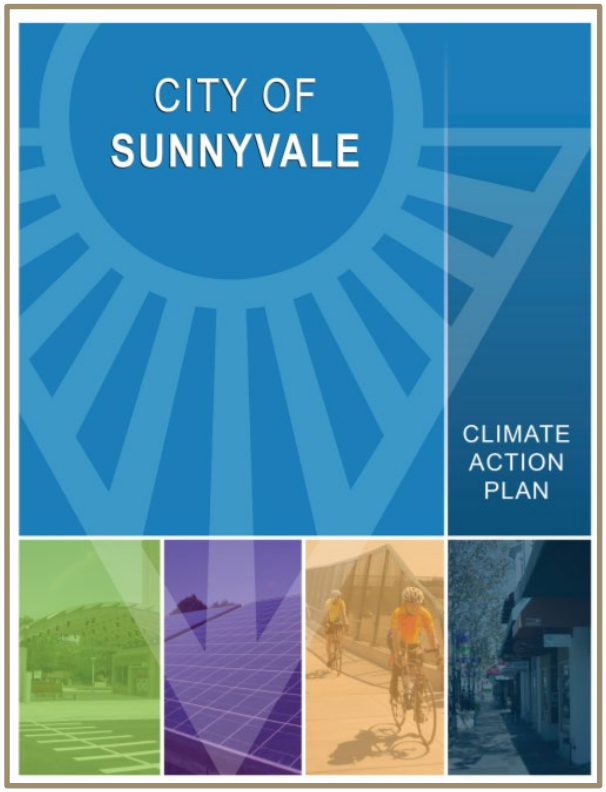
Nupur Hiremath, Sustainability Coordinator

October 25, 2018

Climate Action in Sunnyvale (1.0)

- Climate Action Plan 1.0:
  - Adopted 2014
  - Reduce emissions to 1990 levels by 2020
  - 2016: 12% below 1990 levels
  - With SVCE in 2017: 28% below 1990 levels

- Council Priority: Accelerating Climate Action (Jan. 2017)



Climate Action Plan 2.0

- *For* our community *by* our community
- Focus on 80% by 2050 target
- CAP 2.0 Community Advisory Committee (CAC)
- Community Workshop
- Online (Ideo) platform
- Consultant support
- Collaboration to ensure alignment with city services

What is a Climate Action Playbook?

- Climate Action Playbook:
  - Plan to reduce greenhouse gas emissions to address climate change
- Key Targets:
  - 40% by 2030
  - 80% by 2050
- Playbook contents:
  - Strategies
  - Plays
  - Game Plan: Next Moves

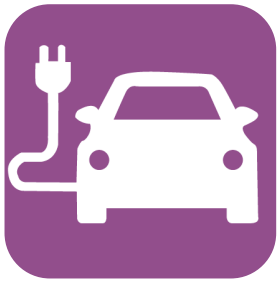
What's inside our Playbook?

Six Key Strategies

Promoting Clean Energy

Decarbonizing Buildings

Decarbonizing Transportation & Sustainable Land Use



Managing Resources Sustainably

Empowering Our Community

Adapting to a Changing Climate

Get your game face on!

Share your feedback online

bit.ly/sunnyvaleplaybook

Get your game face on!

Attend an upcoming public meeting

Tentative Dates

- *Community Meeting*
  November 29 at 6:30 p.m.

- *Climate Action Plan (CAP 2.0) Advisory Committee Meeting*
  December 5 at 6:30 p.m.

- *Joint Study Session (of Sustainability, Planning, and Bike & Ped Commissions)*
  December 6 at 6:30 p.m.

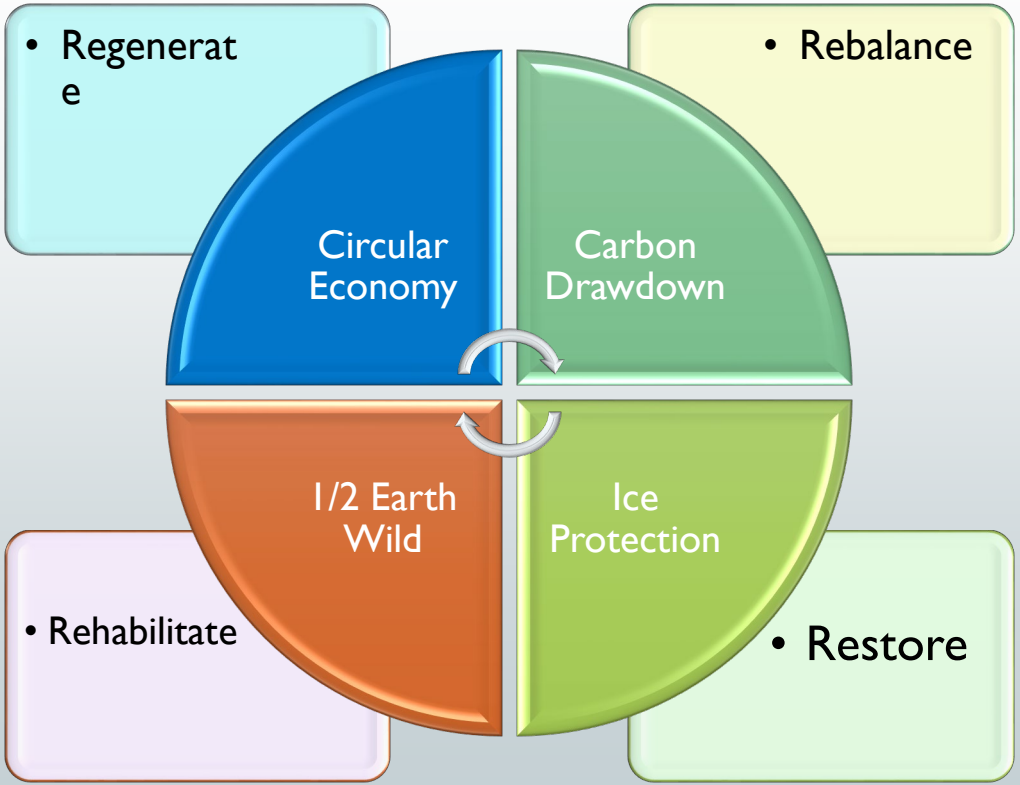
Sunnyvale

green@sunnyvale.ca.gov
408-730-7717

Sunnyvale Environmental Services

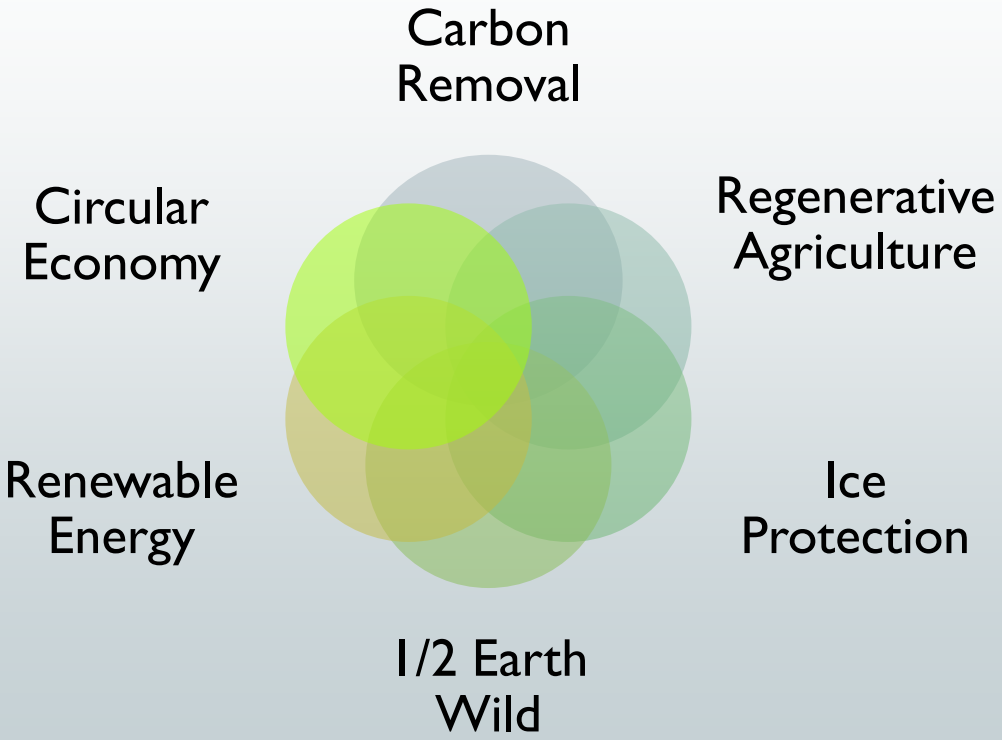
bit.ly/sunnyvaleplaybook

Climate Restoration



Minerva Ventures
Charting a Resilient Path

Climate Restoration



Minerva Ventures
Charting a Resilient Path

Climate Restoration

Reduce
Reuse
Recycle

Circular
Economy

Soil
Health

Carbon
Removal

Low Carbon
Diet
Composting

Regenerative
Agriculture

Efficiency
SVCE
Solar

Renewable
Energy

Ice
Protection

1/2 Earth
Wild

Urban Canopy
Native Plants

Minerva Ventures
Charting a Resilient Path

2018 SUSTAINABILITY SPEAKER SERIES

Home Energy — Taking Charge!

Dave Edwards
Earth Bound Homes

Tom Kabat
SunWork

Steve Schmidt
Home Energy Analytics

Doug Kunz
Sunnyvale all-electric homeowner

Marianna Grossman
Minerva Ventures

Where We Started

- Before Any Electrification (early 2016)
  - Energy Costs ~$4,300/year
- Our Household (early 2017)
  - Cars: 1 EV (2016 Chevy Volt), 1 Gas (2012 Prius V)
  - Natural Gas Water Heater (8 years), Stove (8 years), Dryer (9 years), Furnace
  - No Solar

Our Electrification Project (So Far)

- Goals
  - GHG Reduction
  - Convenience/Flexibility
- Approach
  - Wire to Allow Electrical Replacements for **Water Heater**, Stove, Dryer
  - Add 2nd **EV Charger**
  - Replace HVAC (Furnace) Later
  - Install Solar, Battery Later
- Costs/Timeframe
  - $15k Electrical (electricians on site for 3 days)
  - $1.1k EV Chargers (after tax)
  - $1k Heat Pump Water Heater (versus replacing with gas unit; plumber on site for 1 day)
  - Dryer/Stove costs debateable – could have been deferred, “we splurged”

Results

- Energy Costs: ~$3,000/year
- Zero Natural Gas Use Unless Heating House (Spring – Fall)
- Many Fewer Trips to Gas Station (Convenience/Time Savings)
- House remains comfortable (My family doesn't hate me)
  - Cooler Garage
- Much Larger Expected Payback from Solar (source: Google Project Sunroof)
  - Before: $13,700 "Net Present Value" of 20-Year Savings
  - After: $38,800
- Next Up: HVAC (then Solar)

Home Energy – Taking Charge!

Topics

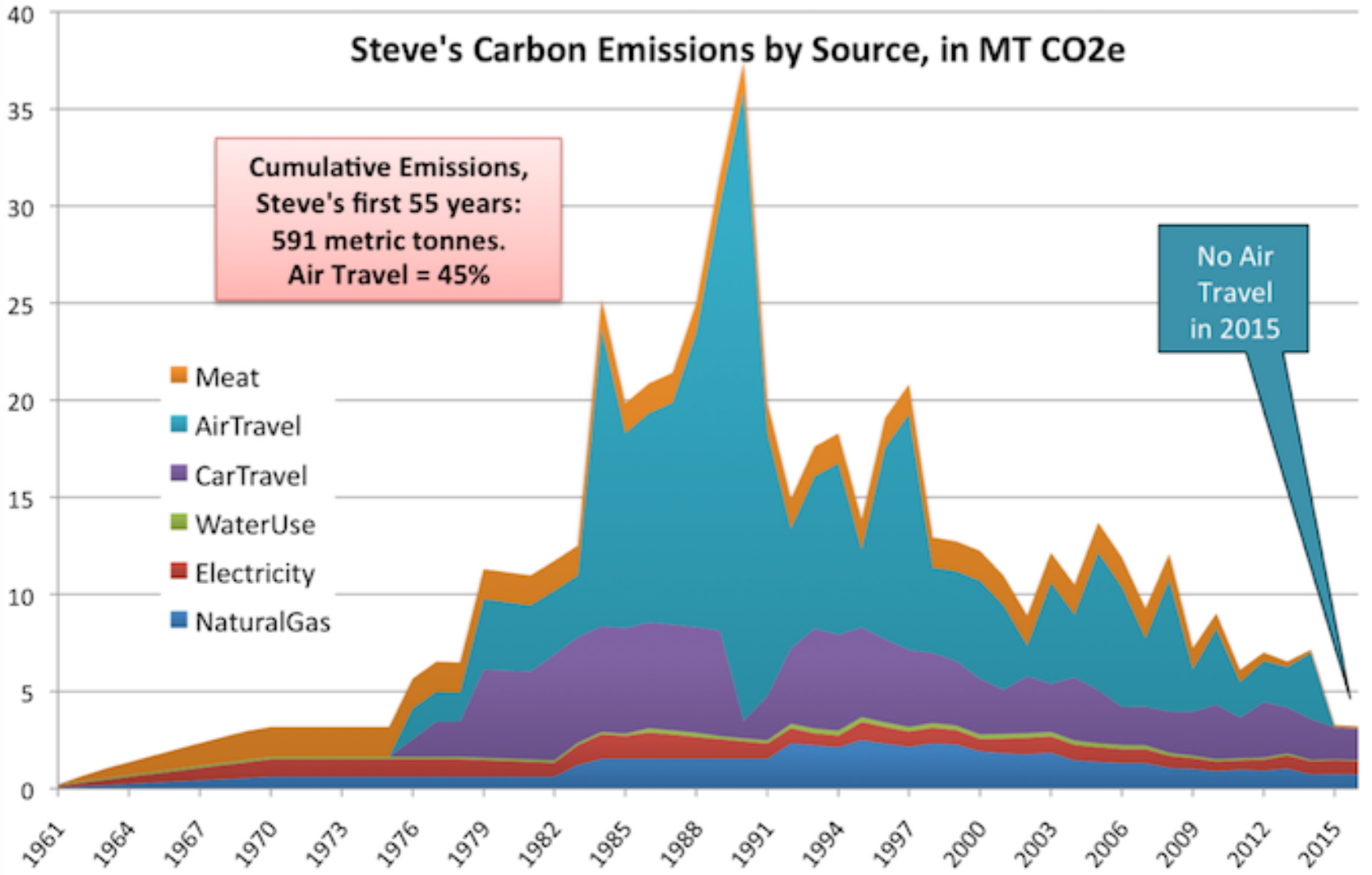
1. Your energy use & carbon emissions are unique!
2. **Energy**: Examples of “True Waste” in homes
3. **Carbon**: Four simple steps to carbon reduction

Steve Schmidt

Founder, HEA.com | Lead Author, Los Altos Hills Climate Action Plan | Alternate LAH Director, SVCE

What’s measured improves.

- Peter Drucker & Andy Grove


Steve's Carbon Emissions by Source, in MT CO2e
Cumulative Emissions, Steve's first 55 years: 591 metric tonnes. Air Travel = 45%
No Air Travel in 2015
Meat
AirTravel
CarTravel
WaterUse
Electricity
NaturalGas
0
5
10
15
20
25
30
35
40
1961
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
2006
2009
2012
2015

Three Types of Home Energy Use

+

+

building

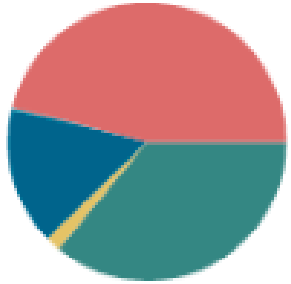
stuff

behavior

Smart Meter Data Mining

$1,924/year

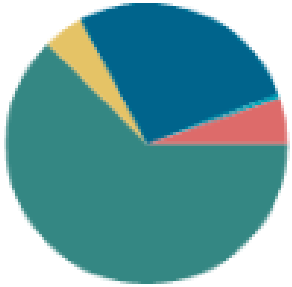
Winter Heating	$885	46%
Summer Cooling	$4	0%
Variable	$308	16%
Recurring	$35	2%
Base	$692	36%



EE Focus: **Building**

$1,927/year

Winter Heating	$100	5%
Summer Cooling	$8	0%
Variable	$522	27%
Recurring	$90	5%
Base	$1,207	62%



EE Focus: **Electric Base Load**

Over the past few decades,

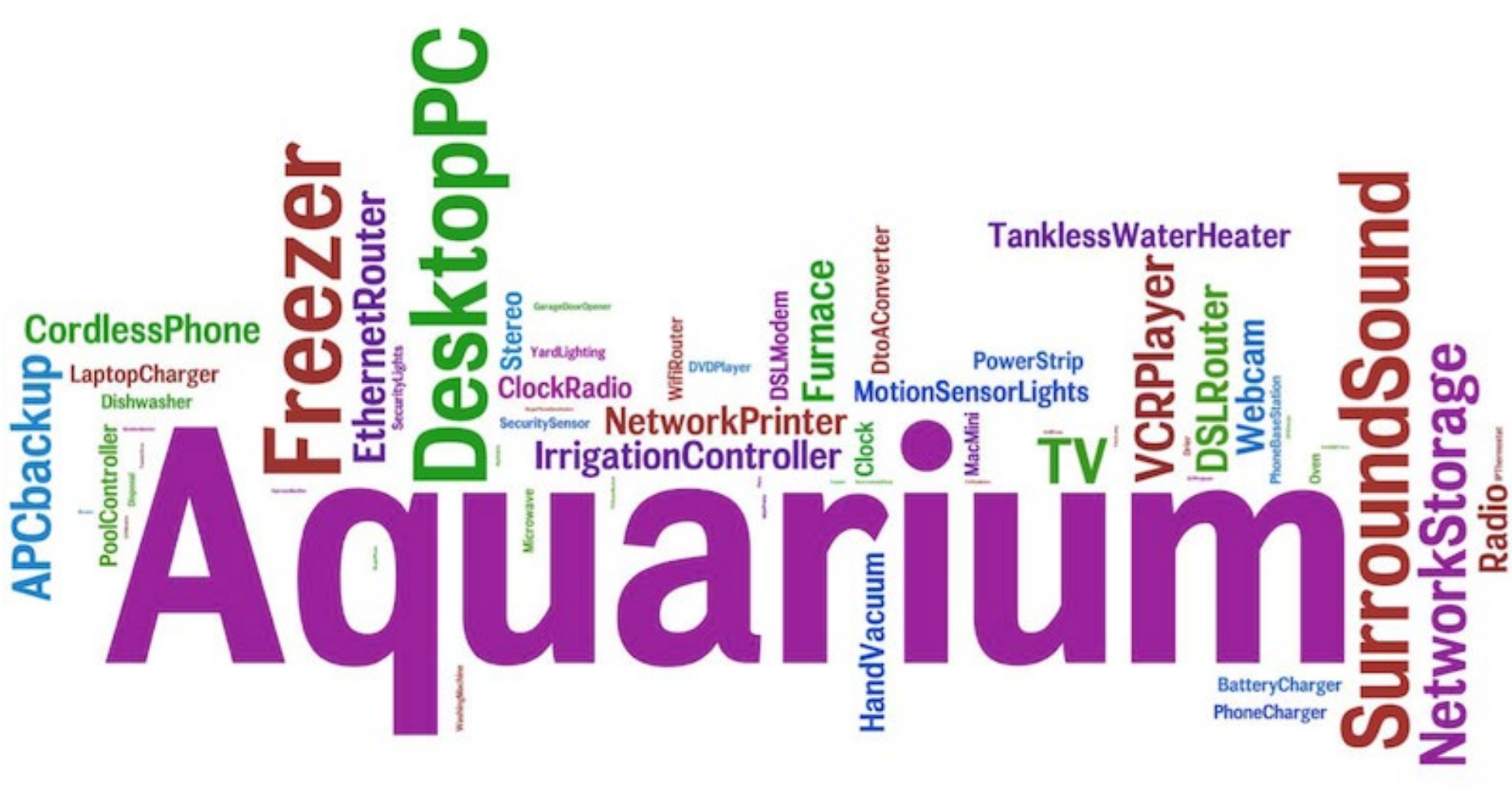
True Waste

exists in more and more homes.

My Plug Loads in 2009

93 things plugged in all the time

600+ watts

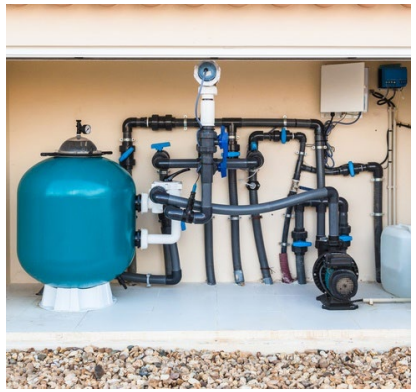


Average Idle load is 220 watts; ~5% of California homes >500 watts

“Miscellaneous accounts for 86% of 2013-2026 residential energy growth.”

CEC

“huh?”: Forgotten



$8,000/year

Pool pump timer ***disabled***, so pump was running 24/7.

$200/year

Fan set up in crawl space after flood damage forgotten; ***left running*** for over a year.

$2,500/year

2 electric resistance baseboard heaters always on in ***unoccupied*** space

$300/year

Fan setting on thermostat changed from “auto” to ***“on”***; left running for over a year.

“really?”: Surprisingly Inefficient

$700/year

Outdoor lighting with over 20 bulbs (300w). *Halogen bulbs.*

$400/year

Heated towel rack using *120 watts* running continuously.

$800/year

Continuous hot water recirc pump ($400 for gas, $400 for electricity)

$1,500/year

20+ year old fridge with 4 bottles of beer plus two dorm fridges with bottled water in each.

“leaks!”: Getting Nothing

$1,500/year

Two “Instahot” hot water dispensers (250W each). *Rarely used*.

$600/year

Electrically heated bathroom floor on when “off” (200W). *Had to turn off breaker.*

$700/year

Whole-house audio amplifier plugged in but *unused for years.*

$0.47 vs. $0.13

Charging an EV at peak times versus middle of the night.

HOME intel

10,000 homes

13%

Savings

HOME ENERGY ANALYTICS

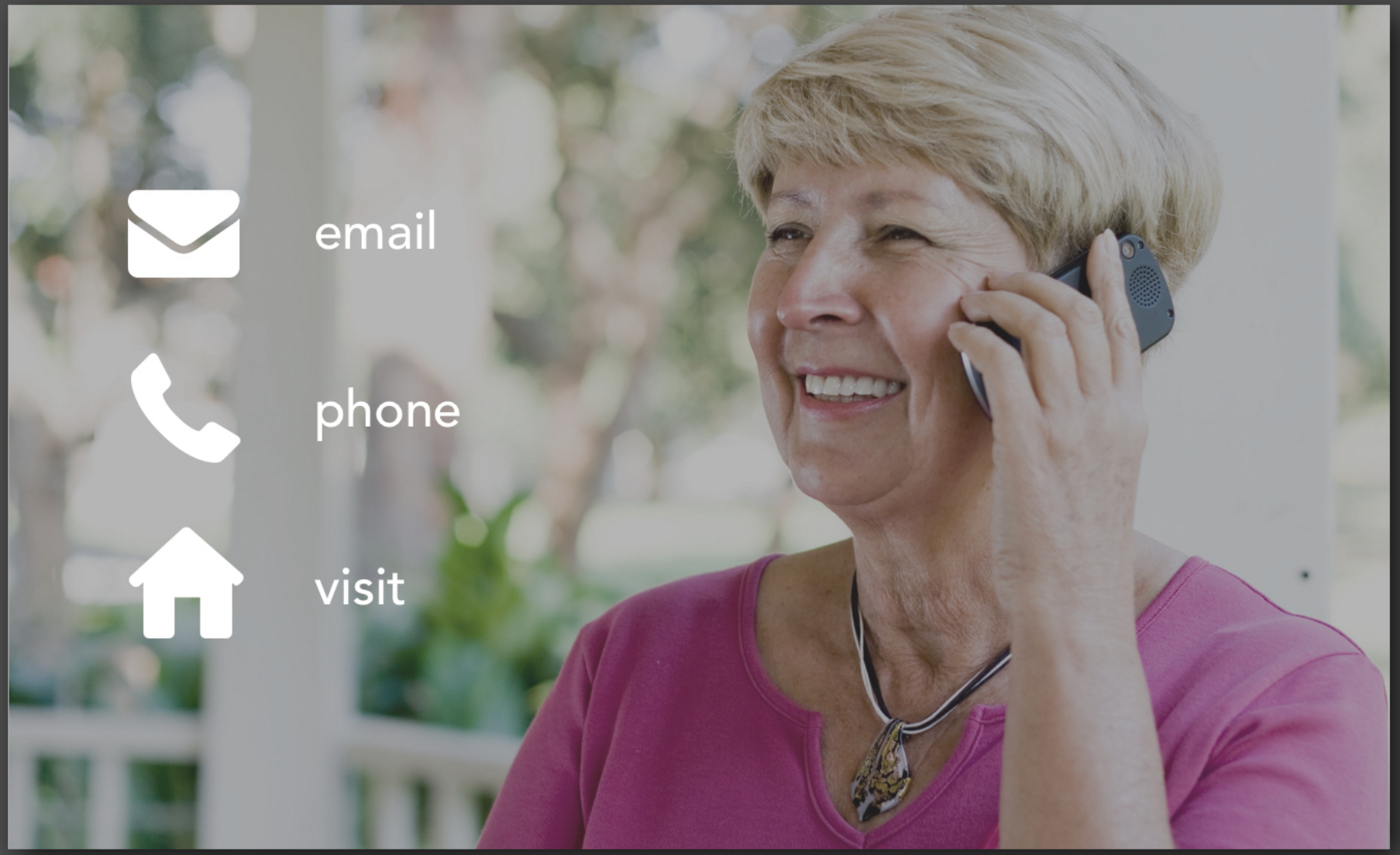
Energy Efficiency v2.0

- Free online Smart Audit
  - No expensive onsite testing required
  - No onsite hardware
- Make simple changes
- Pay for Performance makes it **No Cost**

Sunnyvale

hea.com/sunny

An energy coach is there to guide you along.



Beneficial Electrification

Four Actions = 78% Carbon Reduction!

1. Upgrade to **Clean Electricity**
   - Carbon reduced 13%
   - No change in electric use
2. Upgrade to **Electric Vehicles**
   - Carbon reduced 49%
   - Electric use **up 75%**
3. Upgrade to **Heat Pump Water Heater**
   - Carbon reduced 63%
   - Electric use **up 110%**
4. Upgrade to **Heat Pump Space Heater**
   - Carbon reduced 78%
   - Electric use **up 160%**

SILICON VALLEY CLEAN ENERGY

Take Charge!

1. Get Clean Electricity
   - via CCAs like **SVCE**
2. Measure your Energy Efficiency
   - sign up for **HomeIntel.hea.com**
3. Measure your Carbon Footprint
   - try Berkeley's **CoolClimate Calculator**
4. Embrace Beneficial Electrification
   - Electric Vehicle
   - Heat Pump Water Heater
   - Heat Pump Space Conditioner

SILICON VALLEY CLEAN ENERGY

HOME intel

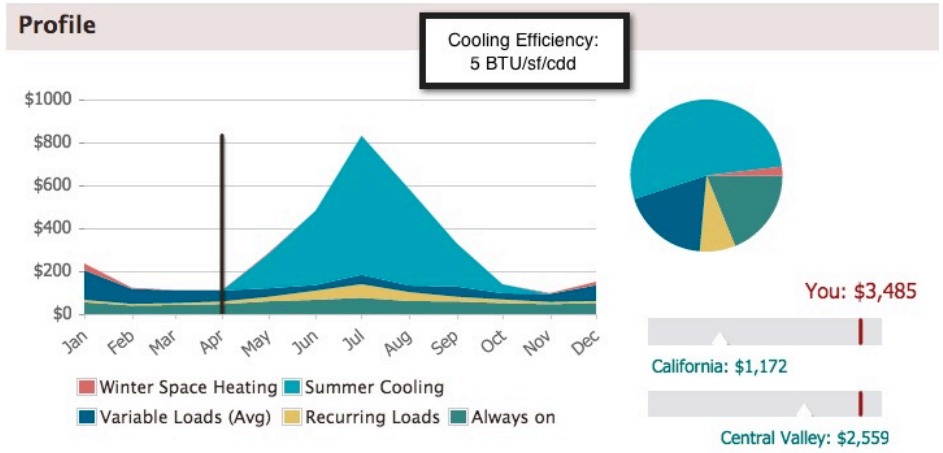
coolclimate.berkeley.edu/calculator

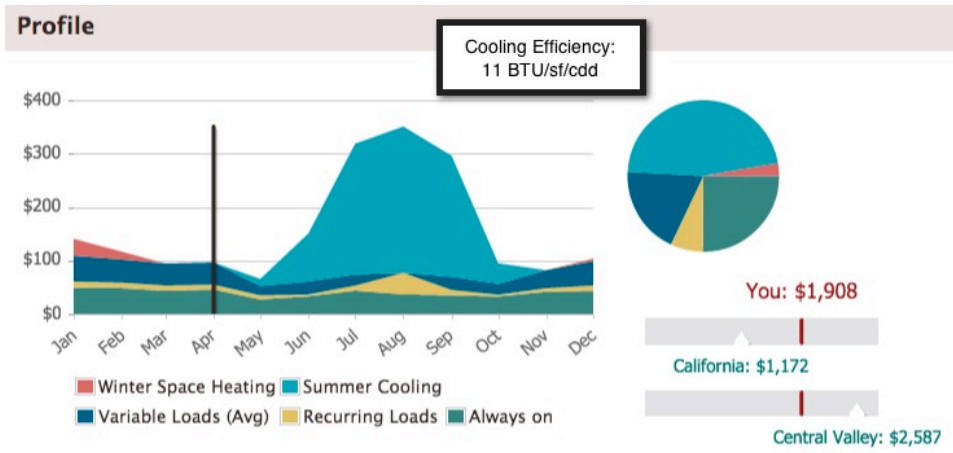
We can do this! Let's show the way.

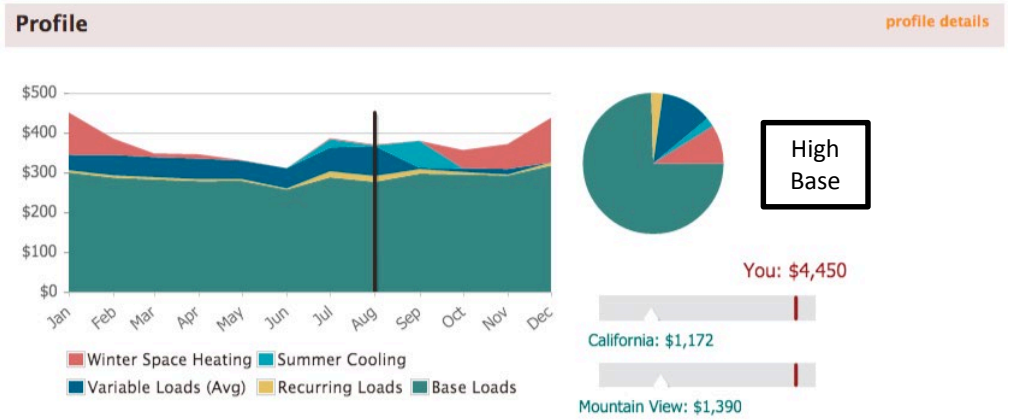
steve@hea.com

background slides

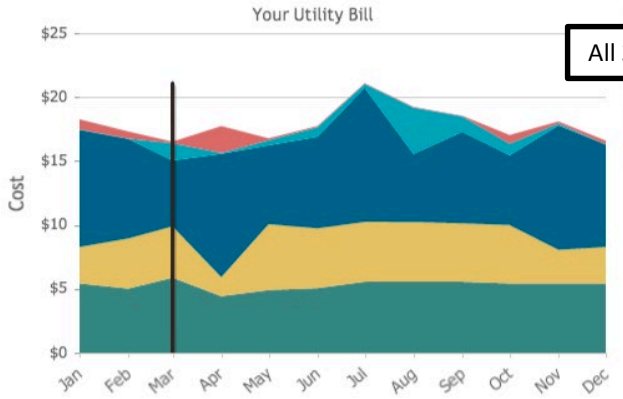
We break down and explain your costs.

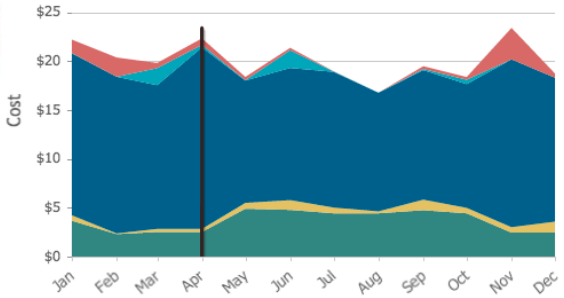


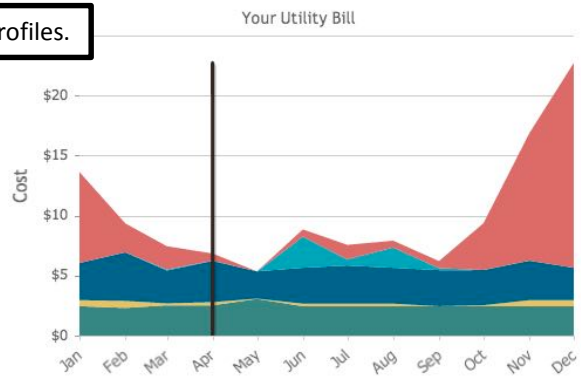




All 3 below are Very Low Energy. Still high variation in profiles.







The Climate Challenge world wide legacy challenge

- Sunnyvale, CA October 25, 2018 (19 days after UN says we have less than 12 years….)
- Your chance to make a difference and set an example
- We are all choosing our legacies on the continuum.

foot dragger… frozen in headlights… participant… early adopter… **leader!**

- Tom Kabat
  - Engineer, Utility Resource Planner
  - Board Member
    - SunWork.org
    - Carbon Free Silicon Valley

We Want Satisfying Lives

- What leads to Satisfaction?
  - Tackling challenges
  - Being part of a bigger movement
  - Doing our part
  - Being part of the solution
  - Showing leadership (and **earning** respect or admiration)
  - Knowing (hoping) I'll be remembered for the good things I did.
    - Investing my time, energy and resources in helping my planet, helping the future
    - Demonstrating personal leadership by making or joining beneficial trends early
    - Sharing what I learn and helping others join in on making progress

Take Advantage of the Energy Transition

- Today… lets look at home energy
- The Electric Supply is cleaner NOW. And the more we learn about gas, the dirtier it looks
  - Congratulations on SVCE! Carbon Free since 2017 and getting cleaner….
    - Clean Electricity is the **Stepping Stone** to secure, healthy, fossil-free home legacy
  - Congratulations on California Leadership
    - 40% GHG reductions from present levels by 2030 (SB 32).
    - Fully carbon neutral by 2045! Carbon negative thereafter (Exec Order Sept 2018)
  - What it means….
    - Ultimately, there's no room for gas use in homes and business.
      - The air will be cleaner and safer to breathe
      - Gas rates will rise (pipeline/drought analogy) The last 10% will pay for all the pipelines
      - Flameophiles can still use a little propane here and there.

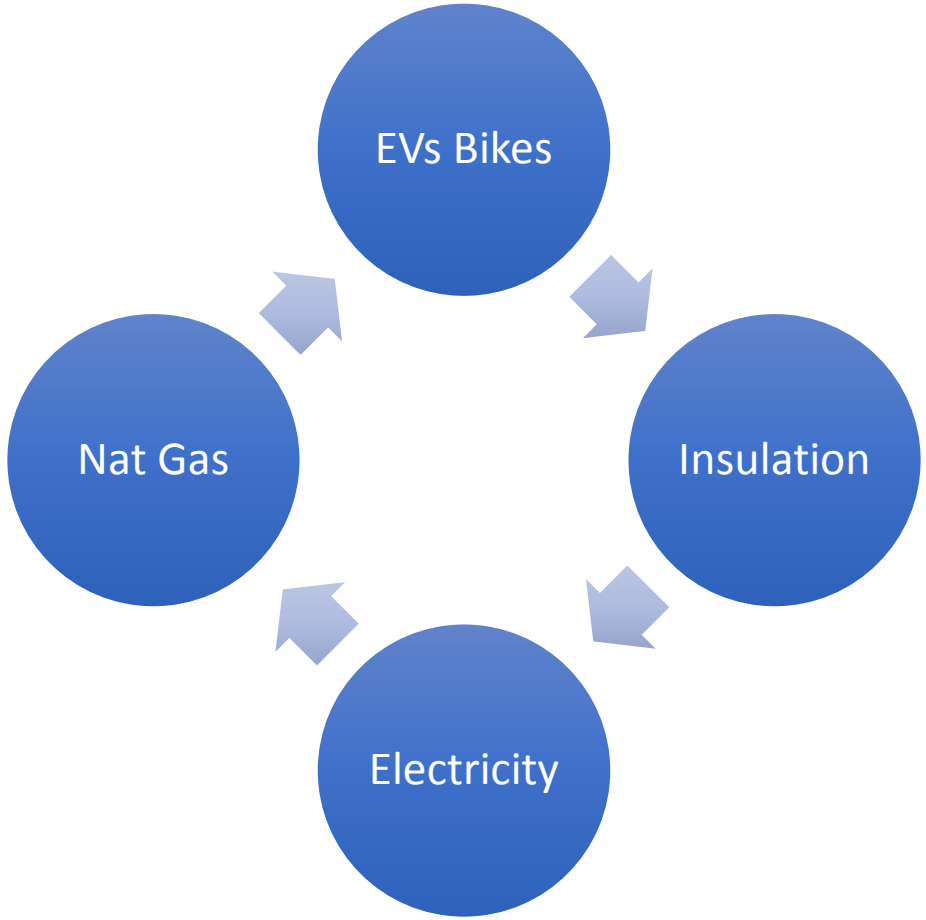
Home Tech and Grid Tech are improved

End Use	Fossil version lb./gal or therm	1980's version % clean	2018 options % clean
	Combustion + Upstream		
Transport	Gasoline 19 lb/gal + 8 lb/gal	10 speed 100%	Electric Vehicle 100%
Water Heating	Natural Gas 12 lb/th + 8 lb/th	Solar Thermal w/ gas backup 70%	Heat Pump WH 100%
Space Heating	Natural Gas 12 + 8	Passive Solar w/ gas backup 70%	Heat Pump 100% Central or mini-split
Cooking	Natural Gas 12 + 8 40% eff	Electric Resistance 15% eff 70%	Electric Induction 100% 90% eff
Drying Clothes	Natural Gas 12 + 8	Electric Resistance 15%	Electric Heat Pump 100% Electric Resistance 100%

Decarbonizing Household Energy

Does it matter where I start?

What should I wait for?

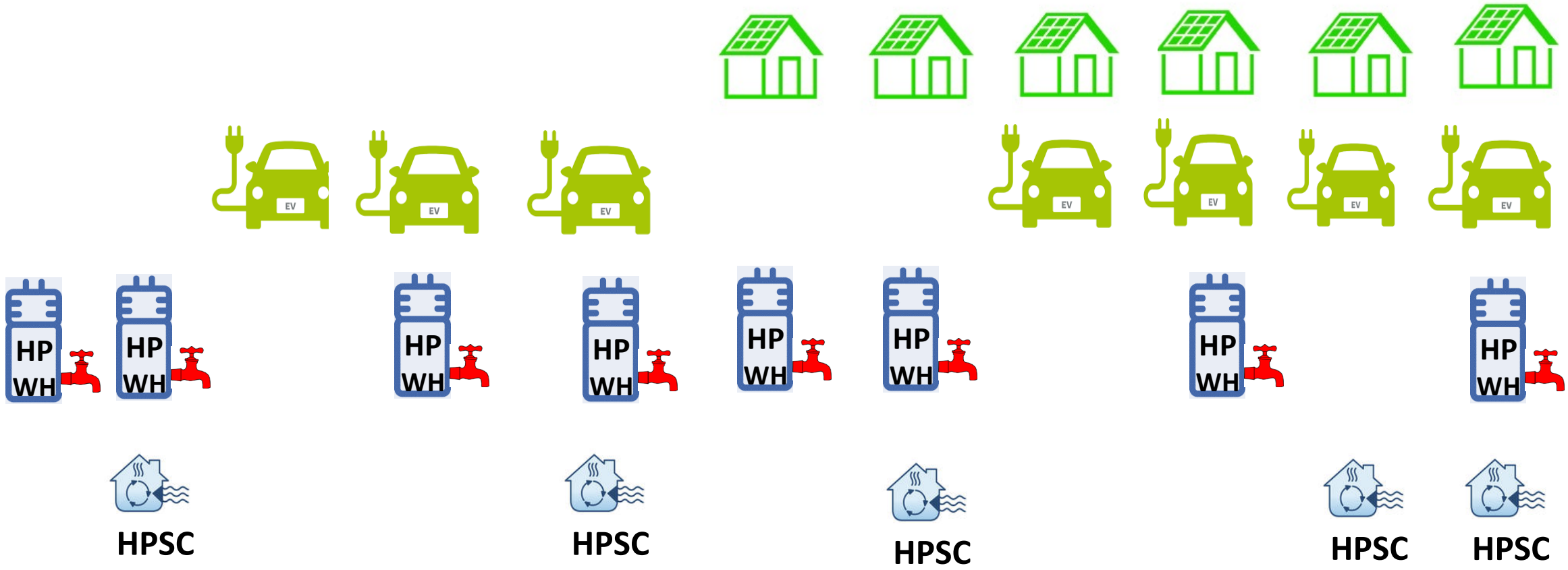


What to do first? Don’t miss any opportunities!

- Timing triggers
  - EV lease one now (don’t try to use up your old car)
  - Insulation Any time and also when you re-roof or remodel
  - HPWH Plan it now, convert before your gas WH’s 10th birthday
  - HPSC Central replacing AC Anytime you want to replace AC (Air Cond.)
  - HPSC Mini split Anytime you want more comfort (heating or cooling)or quiet
  - HPSC econo Anytime you buy a window AC (get window HP instead)
  - Solar on roof When your roof has (ideally) more than 15 years of life left
    - Want a tax credit of 30% in2019 26% in2020 22% in2021 0-to ? in 2022 Better vote
  - Home Battery When you get an EV or when Solar NEM rates decline or dark
    - Also battery can get solar tax credit if it is charged by solar energy

Event	Smart Response
Liking money and fun renters too	Lease or buy EV (could car-sit for friend) Bike ☺
Need long range car (700 mi/day) renters too	Lease or Buy plug in hybrid (100 MPG and up)
Electrician visit for any reason	Negotiate circuit to WH, and circuit to EV, etc
Getting solar (see if higher Eff. panels make sense)	Negotiate circuit to WH, and circuit to EV, etc
WH makes funny sound, or is 10, or looks at you funny	At least get circuit to WH NOW! Or replace w/HPWH
Need a new window AC renters too	Get a window **Heat Pump** instead. Baseload in winter.
Like more cooking fun, speed, success, and health? renters too	Get $100 counter top induction cook-pad.
Need more thermal comfort?	Add minisplit Heat Pump (quiet) or window heat pump
Central AC getting old, or your furnace is old	Central Air source Heat Pump is cheaper than AC+F

Packages Have Synergy different average and marginal rates



Electric Rate

25

20-22

11-25

11-25

11-25

7-25

7-22

7- 11-25

7- 11-25

7- 11-25

7- 11-25

Timing preferences (not rules)

- Solar before roof is 15 years old (cuts 1 cent/kWh)
- Get EV now for fun! and get the advantageous EV rate
  - (improves economics of battery, solar, solar+battery, HPWH)
- Battery After EV, Battery after NEM 3, Battery after ETOU A,B,or C
  - Battery makes East Facing Solar economically attractive for the first time.
- EV anytime (lease EV, a week later sell gas car and use proceeds to buy solar plus HPWH.)
- In the year you will pursue solar or EV, lower your tax witholding ☺ $1st
- Central HP when Central AC is old. Minisplit HP to improve comfort anytime. Switch to elec. heat baseline rate allowance.
- Any electrician visit.. do WH conduit and EVSE NEMA 1450.

BE = Beneficial Electrification

Economical & Ecological

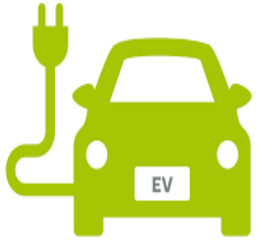
SAVE
$$* &
Our PLANET

*estimated based on a working family of 4 excluding costs and incentives over 10 year life

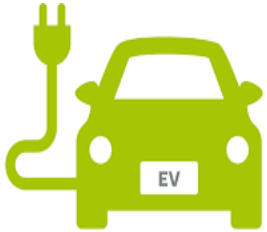
Bundle
and
Save

Solar

HP Heat
& Cool



Solar



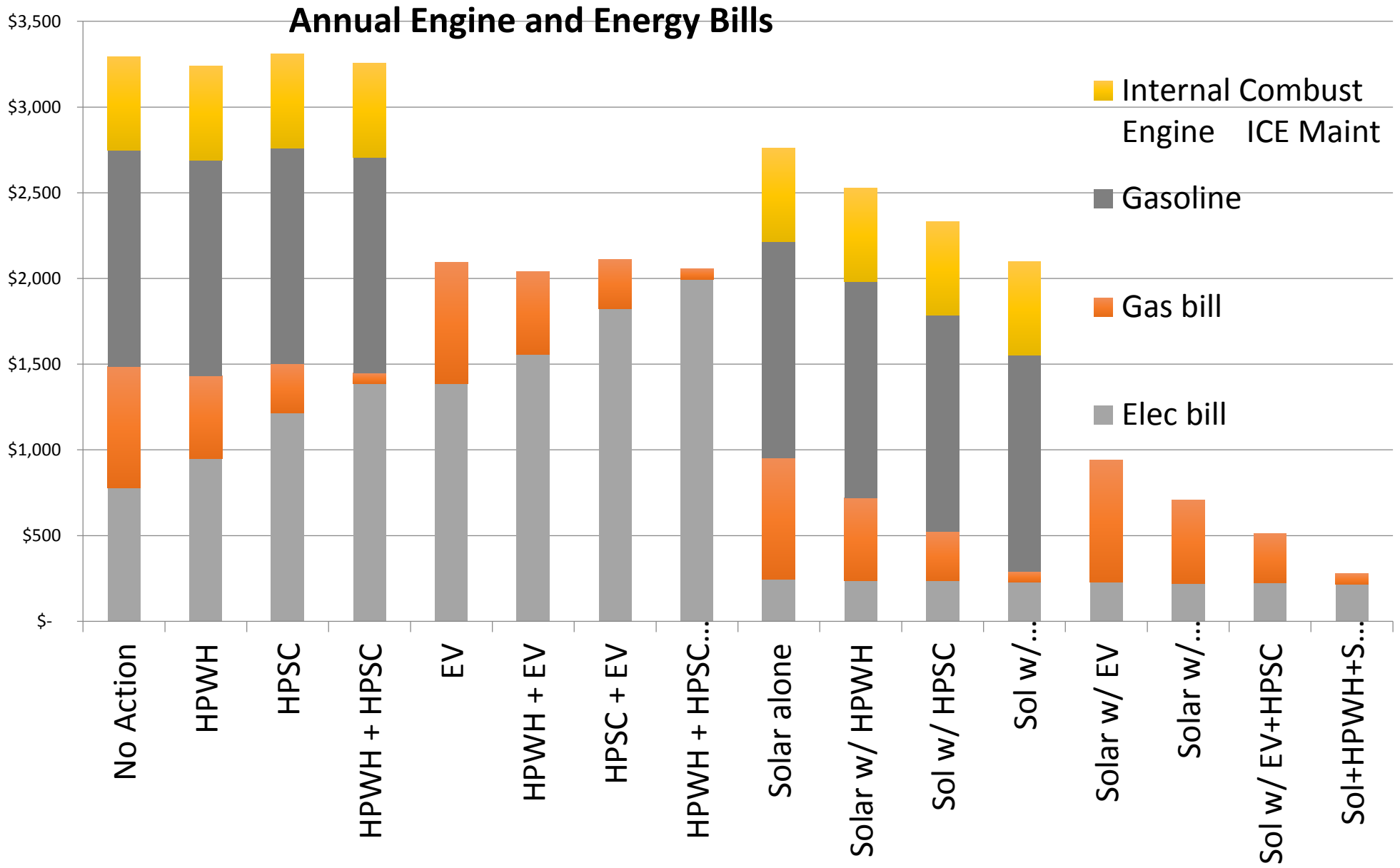
10 year $ Savings
& Carbon Savings

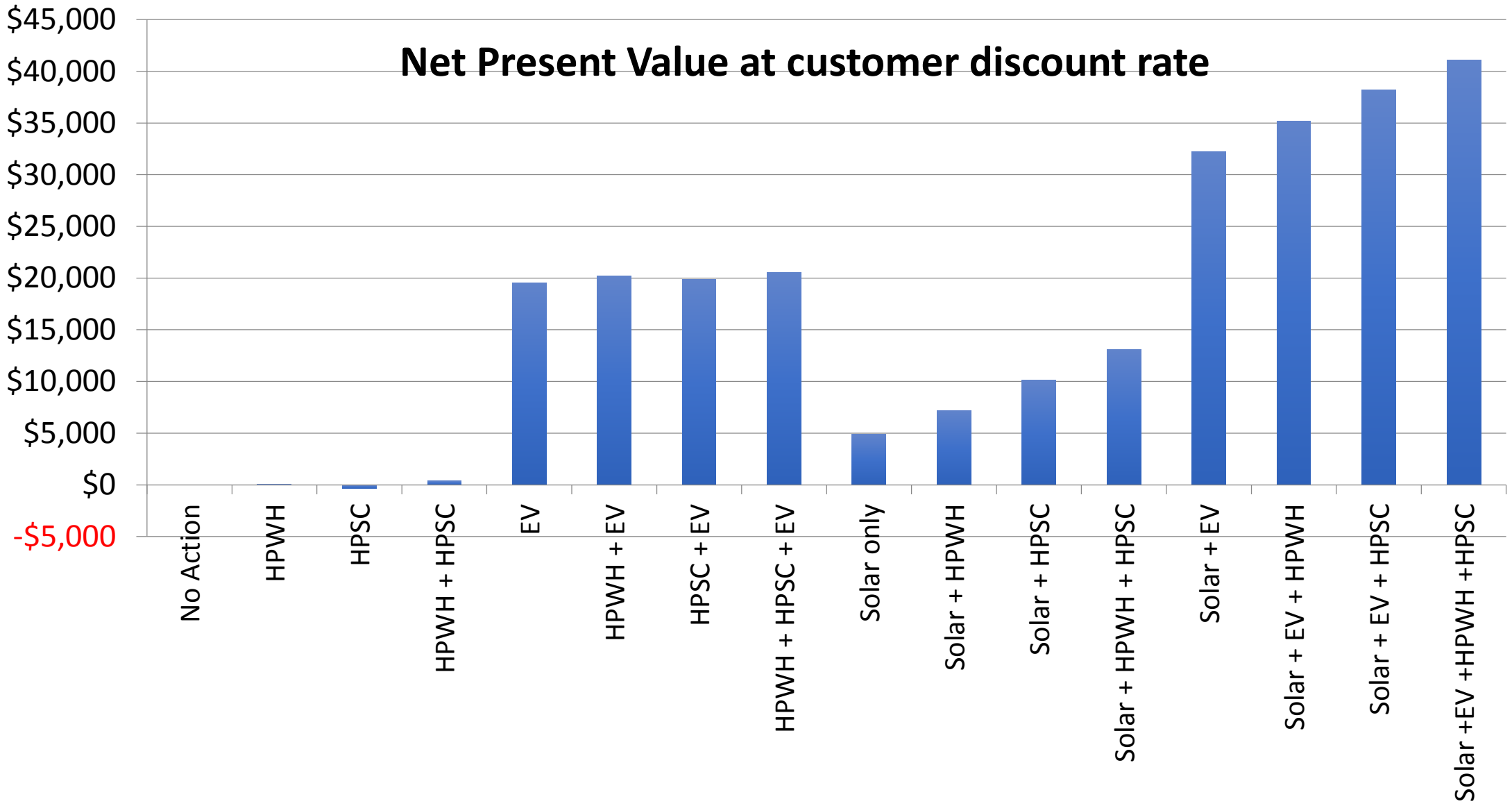
$36,000 Savings
101 Tons CO2

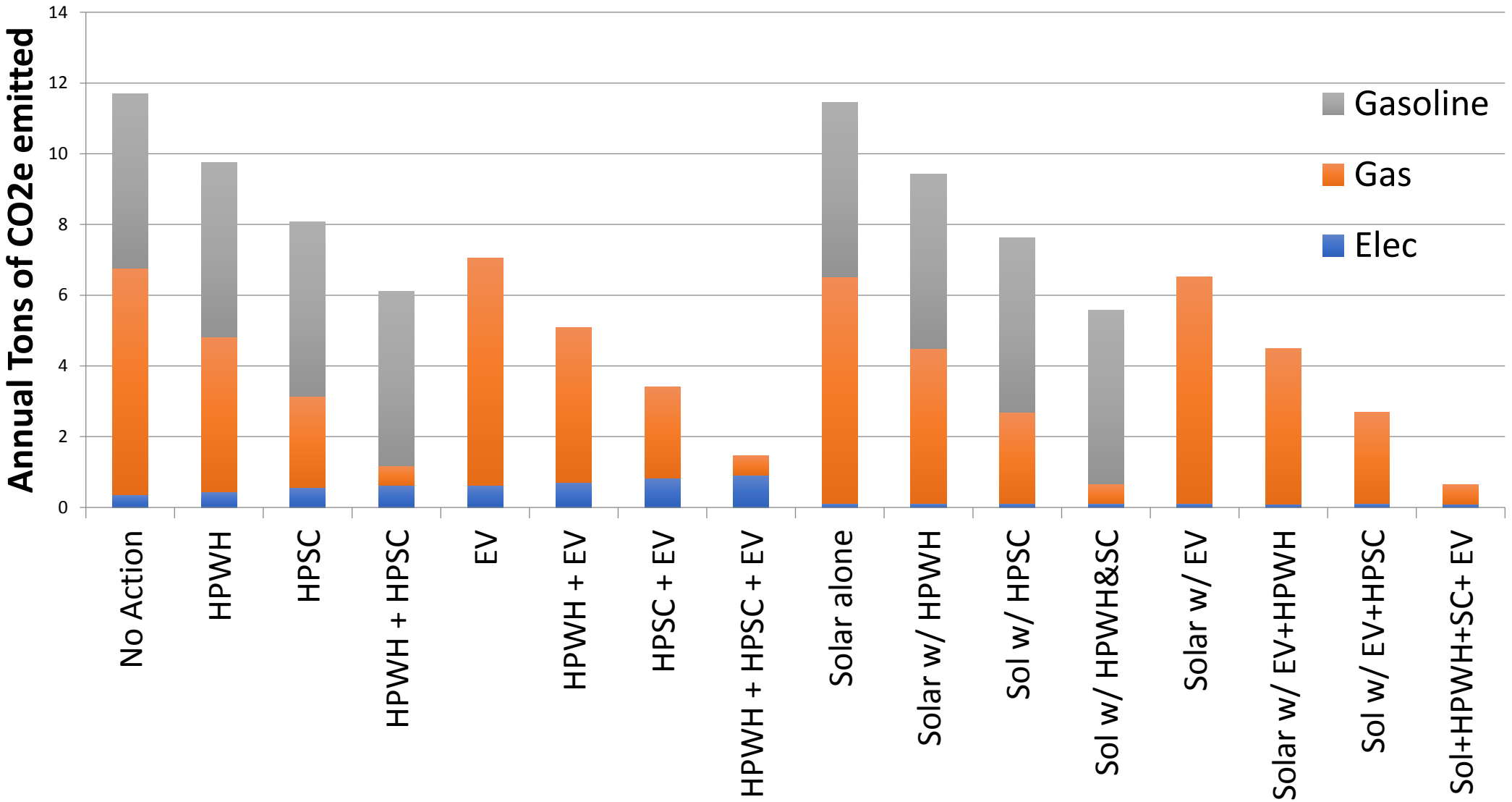
$31,700 Savings
66 Tons CO2

$12,200 Savings
58 Tons CO2

BE Ready = Thinking ahead and Bundling to save $


Annual Engine and Energy Bills
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$-
Internal Combust Engine
ICE Maint
Gasoline
Gas bill
Elec bill
No Action
HPWH
HPSC
HPWH + HPSC
EV
HPWH + EV
HPSC + EV
HPWH + HPSC...
Solar alone
Solar w/ HPWH
Sol w/ HPSC
Sol w/...
Solar w/ EV
Solar w/...
Sol w/ EV+HPSC
Sol+HPWH+S...


Net Present Value at customer discount rate
$45,000
$40,000
$35,000
$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$0
-$5,000
No Action
HPWH
HPSC
HPWH + HPSC
EV
HPWH + EV
HPSC + EV
HPWH + HPSC + EV
Solar only
Solar + HPWH
Solar + HPSC
Solar + HPWH + HPSC
Solar + EV
Solar + EV + HPWH
Solar + EV + HPSC
Solar +EV +HPWH +HPSC


Annual Tons of CO2e emitted
14
12
10
8
6
4
2
0
Gasoline
Gas
Elec
No Action
HPWH
HPSC
HPWH + HPSC
EV
HPWH + EV
HPSC + EV
HPWH + HPSC + EV
Solar alone
Solar w/ HPWH
Sol w/ HPSC
Sol w/ HPWH&SC
Solar w/ EV
Solar w/ EV+HPWH
Sol w/ EV+HPSC
Sol+HPWH+SC+ EV

What to **AVOID**

- Avoid Tankless water heaters
- Avoid Solar Thermal Water Heating only 70% for $9k…. Get HPWH
- Avoid waiting for next thing e.g. avoid old “ROT” that delay you
- Avoid risk of gas water heater blow-out (quit “saving” by risking)
- Avoid buying any AC without Heat Pump capability
- Avoid stranding a new gas furnace in your house (lasts into $ obs)
- Avoid “using up” your gas car (sell it before they’re all obsolete)
- Avoid exposing your family to pollution of gas cooking (formaldehyde)

Ideas?

- let’s get started
  - Making progress
  - Reducing danger
  - Finding happiness
  - The only prudent speed…. is Full Speed !

Triangle Vineyard

Grand View

Cupertino Modern

Ultra

Greene and Green

Sunnyvale Color

Waterdog

Other Projects

Give us your feedback!

Fill out a paper feedback form or type in this link:

http://bit.ly/SVLtakecharge